Ontario

Modifying Industrial Operations Protocol

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Printed in Ontario, Canada

Copies of this publication are available on the Aviation and Forest Fire Management Branch website:

http://affm.mnr.gov.on.ca/spectrasites/internet/affm/fire.cfm

This publication should be cited as:

OMNR, 2008. Modifying Industrial Operations Protocol.
24 pages
MNR# 52136
ISBN 978-1-4249-5545-9 Print

Cette publication est également disponible en français.

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Modifying Industrial Operations Protocol

The Ontario Ministry of Natural Resources (MNR) has the lead responsibility for wildfire prevention, suppression and management on Crown land in Ontario. This protocol provides direction to forest managers and industrial operators for the prevention and suppression of wildfires in forested areas within the fire regions during the fire season, normally April 1 - October 31.

The goal is to ensure that:

- Industrial operations are conducted in a manner that prevents wildfires from starting and does not increase the seasonal forest fire load.
- Wildfires are detected & reported.
- Industrial operators continue to work safely as long as possible as the fire danger increases.
- Employees are adequately trained to use available equipment to take safe action that will reduce the negative impact or damage from a fire, should one occur.

The protocol provides a consistent methodology for modifying industrial activities by:

- Determining when and where forest operations should be modified depending on the fire danger and the risk of the operations igniting a wildfire.
- Incorporating other prevention methods in daily operations to reduce the risk of fires escaping within operating areas (i.e., fire suppression training, detection, and communications).

1.0 Fire Prevention and Suppression

1.1 Planning

Fire prevention and preparedness plans are required for industrial operations in forested areas. The plan should include, but is not limited to:

1. Company and MNR contacts
2. Type of operations by risk category
3. Fire prevention planning
    - Fire prevention programs and initiatives
    - Fire prevention monitoring
4. Fire preparedness planning
    - Fire suppression training
    - Suppression equipment available
    - Actions to be taken when a fire is detected
    - Communications plan(s)

If operational direction is to deviate from that outlined in this protocol, this will be noted in the fire plan.

1.2 Fire Suppression Equipment

As per the Forest Fires Prevention Act (FFPA), **serviceable fire extinguishers must be on or within 5 meters** of all mechanical equipment operating in the forest.

Persons conducting industrial activities in the forest must also have available fire suppression equipment for suppressing wildfires that are started by the operation or are discovered in the course of daily operations. For groups of workers working in the same general area (e.g., cut block) this equipment can be stored in a "fire equipment cache" located centrally to the worksite. The cache must be located as close as possible to but no further than 10km from the operations.

Workers must be able to get the fire equipment cache to the fire location within **20 minutes** by ground transportation. If this is not possible, a second cache will be necessary. A fire equipment cache contains a minimum of:

- one pumping unit, and
- 3 shovels

If a fire occurs and parts of the fire equipment cache are used in fire suppression efforts, the cache must be returned to a serviceable condition prior to work commencing the next workday.

Table 1 identifies the types of operations that require a fire equipment cache or other fire suppression equipment such as backpack pumps. Independent businesses with separate or unique contracts/ licenses working within a 10Km radius of each other will each (independently) be required to have adequate suppression equipment, as identified in Table 1.

If two or more of these independent contractors wish to aggregate and collectively come together to share equipment across the operational area (the 10Km radius), this will be identified in the Fire Plan. These collective operational areas must identify communication plans and response actions to be taken should a fire be discovered, as discussed within the fire prevention and preparedness plan.

It is recommended that the backpack pump be carried on some machines as outlined in Table 1. If an alternative backpack location is to be used, this will be outlined in the fire plan.

Most non-mechanical, low-risk forest activities such as timber cruising or regeneration surveying do not require fire suppression equipment. However, labour-intensive activities such as hand tending and tree planting do require some suppression tools as outlined in Table 1.

Table 1: Suppression Equipment required by operation			
Operations	Number of Machines	Number of Equipment Caches	Backpack Pumps*
Heavy equipment with tire chains or tracks, working in forest fuels.	1 – 5 6 +	0 1	1/machine
OR**: Heavy Equipment at work within a 10km radius of each other (includes hot work).	1 - 9 10 +	0 1	1/machine or hot work operation
Tree plant, manual tending or other labour-intensive operations		0	1 for every 4 workers, to a maximum of 10/site

* A serviceable pressurized *water delivery system* located on a machine can replace a backpack pump.

**Only one fire equipment cache will be required on site, providing it is within 20 minutes (by ground transportation) of all equipment.

1.3 Fire Suppression Capabilities

Anyone working in the forest who is expected to use fire suppression equipment must be adequately trained to use that equipment. Operations that meet the "Trained and Capable" standard outlined below may qualify to work longer during higher fire danger periods, as they should be trained and capable to suppress any fires that start.

"**Trained and Capable**" operations must meet each of the following criteria:

1) **Prevention**: Implementation of an effective prevention program for the type of operation, as outlined in the fire prevention and preparedness plans.
2) **Suppression**: Minimum resource and equipment availability as identified in this protocol (section: 1.2 Fire Suppression Equipment).
3) **Communication**: The ability to communicate and report fires **immediately** and to receive or obtain updated information on the fire danger.
   - **Immediately** means two way radio or telephone capabilities from the site to the company or MNR office.
4) **Training**: A minimum 25% of all staff involved in forest operations on a particular site must be trained to the MNR SP-102 standard.
   - Industry will implement refresher training to ensure that their staff are proficient with the material covered within the SP 102 course.

Operations that do not meet all of the above criteria will be considered Limited Operators with respect to the modifications that will apply to their operations.

2.0 Determining Operational Risk & Fire Danger

This protocol is based on the premise that industrial activities should be modified as fire danger increases to reduce the risk of igniting a wildfire. The general steps in the protocol for determining how and when operations should be modified by considering the fire danger and risk of ignition from the operations are outlined below.

1. Determine Operational Risk:
   - Using **Table 2**: Operational Risk Classification
2. Determine if the forest is in Leaf On/Leaf Off condition:
   - Local MNR Fire Management Supervisor
3. Determine Fuel Group (1-5) on the worksite using **6.0 Fuel Group Decision Keys**:
   - Determine initial fuel group
   - Account for applicable modifiers (+1/-1)
   - Determine final fuel group
4. Obtain the fire intensity code:
   - Using the closest weather station
   - Based on the worksite Fuel Group
   - Reported each afternoon for the next day
5. Determine work modifications, for the next day:
   - Using **4.0 Operational Modifications Table – Table 5**
6. Modify operations the next day as necessary

The following sections provide details and background information regarding each of these steps.

Appendix A is a Field Guide to the Modifying Industrial Operations Protocol and contains the tables and charts required for daily application and interpretation of the protocol in the field.

2.1 Operational Risk

Certain industrial operations are more likely to create a source of ignition (i.e., spark). Common forest operations are categorized into four levels of operational risk:

- Low (L)
- Moderate (M)
- High (H), and
- Very High (VH)

The risk classifications are based on the potential for the operation to create a spark or other source of ignition, where the operation takes place, the presence of stones or bedrock and forest fuels. Operational modification will not be required for low risk operations unless extreme fire danger or a wildfire event requires forest closure or an Emergency Area Order restricts access to some areas of the forest.

Table 2 outlines the operational risk for common forest operations. The level of risk for operations not identified in Table 2 will be determined in consultation with the local MNR fire management supervisor and described in the fire plan.

Table 2: Operational Risk Classification

Operation		Surface stoniness <15%	Exposed bedrock OR = or >15% Surface Stoniness
Road Construction	- Stripping with bulldozer	M	VH
	- Blasting without mats	M	H
	- Blasting with mats	L	L
	- Building, spreading and shaping sub-grade with back hoe/excavator	L	M
	- Graveling/grading roads	L	L
	- Dozer flattening of sub grade (mineral soil)	L	L
	- Stream work: water crossing installation/ repairs, bridge work, stream rehabilitation	L	L
Harvesting	- Tracked equipment such as feller-bunchers, or machines with rotary cutting heads	H	VH
	- Vehicles with tire chains (i.e., forwarders, skidders)	H	VH
	- Mechanized equipment with rubber tires (no chains) (i.e., forwarders, skidders)	L	M
	- Power Saw /Chainsaw	L	M
Processing	- Delimbing, slashing, portable saw mills	M	M
	- Portable chipping	L	L
	- Loading wood or gravel and hauling	L	L
	- Power Saw / Chainsaw	L	M
Silviculture	- Mechanized site preparation	H	VH
	- Mechanical tending with chain flails and mowers; hydro-axe; slash piling	H	VH
	- Brush saw/chainsaw thinning	L	M
	- Tree planting, manual brushing (cleaning)	L	L
Other	- Hot work: welding, torch cutting and grinding	H	H
	- All-terrain vehicles wheels or tracked	L	M
	- Other non-mechanical forest operations (i.e., timber cruising, regeneration surveys)	L	L

L = Low M = Moderate H = High VH = Very High

Note: Any Operation working exclusively on mineral soil, clay, gravel, (e.g., on roads and landings, where there is no continuous fuel component) is classified as **Low Risk**

2.2 Fire Hazard

Fire hazard is a general term used to describe the *potential* fire behaviour based on the physical characteristics and arrangement of forest fuel (forest vegetation) without regard for weather influences (e.g., moisture content).

The classification of the forest into general "fuel groups", based on certain stand characteristics, provides an initial indication of the potential fire behaviour should a fire ignite. This protocol uses 5 fuel groups derived from the fuel types defined within the Canadian Forest Fire Behaviour Prediction System (FBP).

These fuel groups classify the work area (the area that will be operated on during one day/shift) at the forest stand level. The fuel group is determined by observing the nature of the stand/site, such as the amount and condition of conifer/deciduous vegetation, presence of understory vegetation, ladder fuels, etc. and going through the fuel group key to determine the actual fuel group.

The 5 fuel groups are outlined, generally, in **Table 3**. Site-specific fuel groups are to be determined on site using this protocol's fuel group key, developed to assist forest operators in determining the type of forest fuel or "fuel group" on the site. This decision key can be found in section **6.0 Fuel Group Decision Keys** of this document.

Table 3: General Fuel Group Descriptions

Fuel Group	Hazard Level	General Description
5	Very High	Mature upland boreal spruce with conifer understory, immature conifer, mixedwood stands with dead balsam fir, cured grass and slash-dominated sites
4	High	Mature upland boreal spruce without conifer understory, conifer plantations and mixedwood stands with 50-75% conifer
3	Moderate	Mixedwoods (25-50% conifer), mature jack pine, self-thinned and pruned spruce and immature jack pine stands
2	Low	Deciduous dominated mixedwoods (<25% conifer), spruce-lichen woodlands, mature red and white pine, conifer on peat/organic soils
1	Very Low	Deciduous species and live grass-dominated stands

2.3 Fire Danger

Fire Danger is a general term used to describe an assessment of the fire environment (i.e., fuel, weather, topography) that determines the ease of ignition, rate of spread and difficulty of control of a fire. This protocol uses a measure of fire intensity (Fire Intensity Code) as the key indicator of rate of spread and difficulty of control and therefore overall danger if a wildfire should start.

The Fire Intensity Code is determined using two fire weather index parameters (i.e., build-up index [BUI] and initial spread index [ISI]), and the fire intensity charts developed from the Canadian Forest Fire Behaviour Prediction System.

The fire intensity codes range from Intensity Code A at the high danger level, through to E at the lower danger level.

Table 4, below, relates the intensity code to the potential head fire intensity and type of wildfire, as well as the type of action wildfire suppression agencies might take at each level. It is generally accepted among fire agencies that 2000 kW/m is the upper limit of safe action by ground crews. Beyond 4000 kW/m continuous crowning and fire spotting is likely.

Table 4: Fire Intensity Code relation to Potential Head Fire Intensity and Suppression Capability

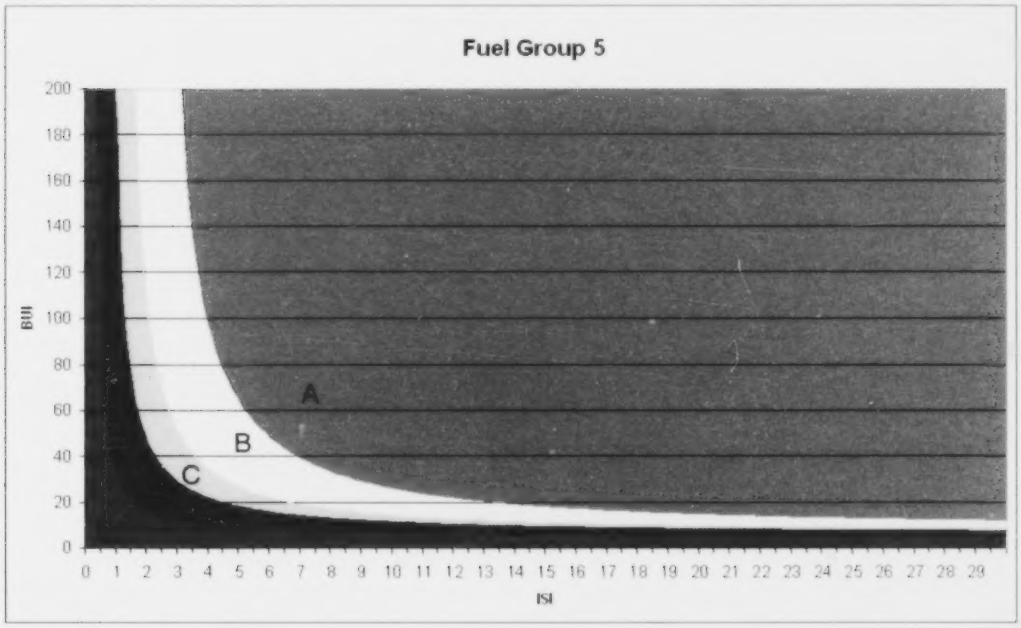
Fire Intensity Code	Potential Head Fire Intensity (kW/m)	Fire Type - Typical suppression Tools and Tactics
A	>10000	Continuous crown fire, medium to long range spotting, major fire runs possible - In direct attack and burn-out operations
B	4000 – 10000	Intermittent and continuous crowing - Indirect attack and burn-out operations
C	2000 – 4000	Intermittent crown fire with spotting - Pumps on flanks, air tankers/ bucketing on head
D	500 – 2000	Surface fire with torching - Pumps and hose with air support (bucketing or tankers)
E	0 – 500	Smouldering and creeping - Handtools and backpack pumps

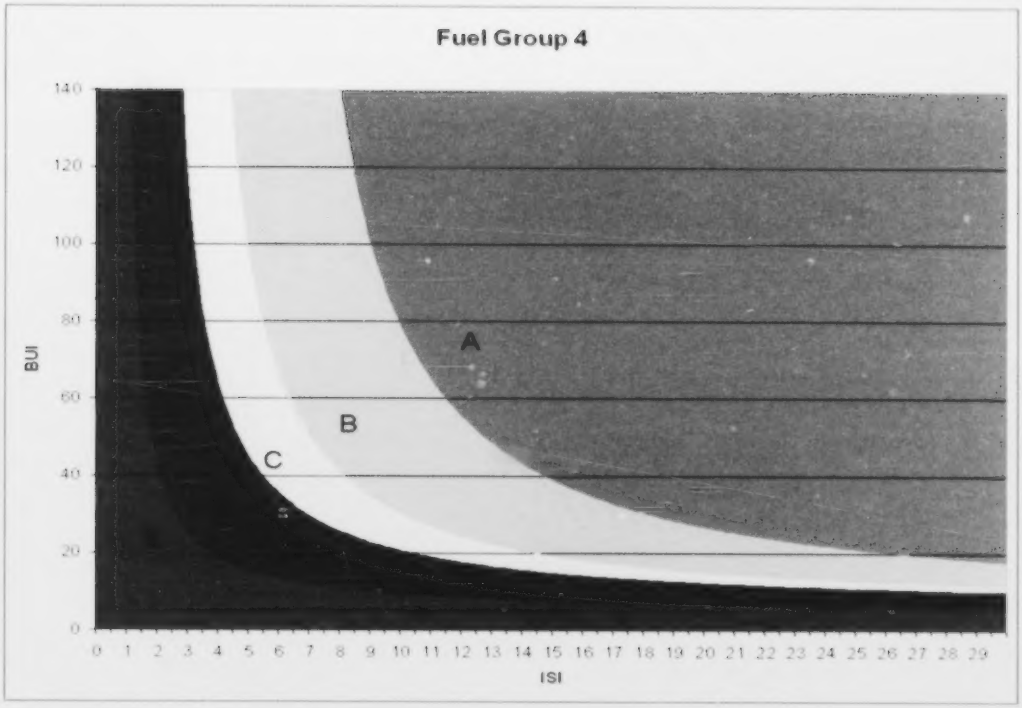
3.0 Fire Intensity Code Charts

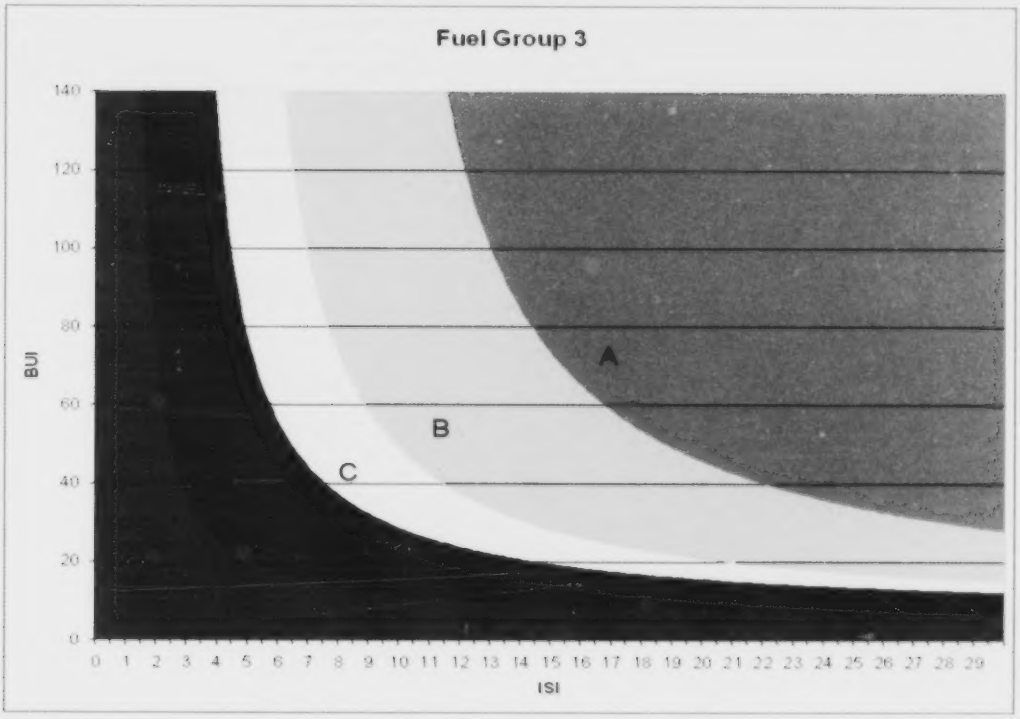
There is one Fire Intensity Code chart for each Fuel Group. To use the charts:

1. Select the fuel group determined using section **6.0 Fuel Group Decision Keys**
2. Plot appropriate fire weather indices (BUI and ISI) for the applicable weather stations to determine the *fire intensity code*.

Note: When ISI values are reported to a decimal place the value should be rounded up or down to the nearest whole number (<0.5, round down; >=0.5, round up).




Fuel Group 4
BUI
ISI
A
B
C

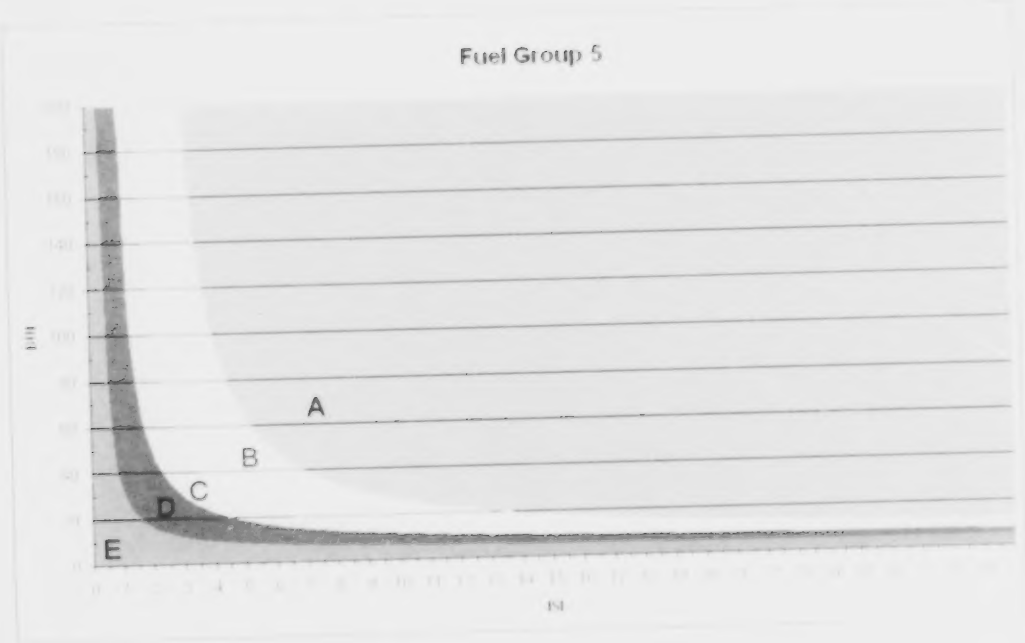

Fuel Group 3
BUI
ISI
A
B
C

3.0 Fire Intensity Code Charts

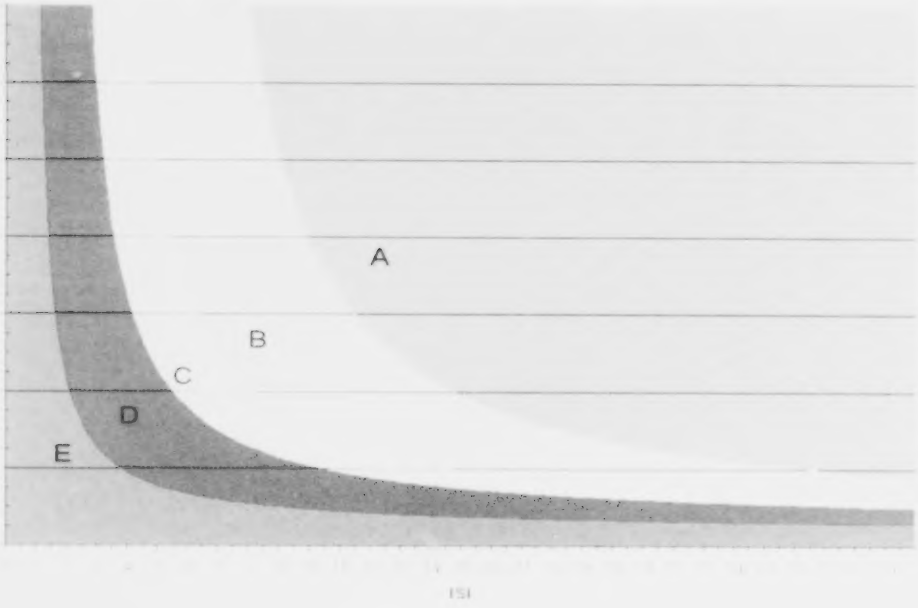
There is one Fire Intensity Code chart for each Fuel Group. To use the charts:

1. Select the fuel group determined using section **6.0 Fuel Group Decision Keys**
2. Plot appropriate fire weather indices (BUI and ISI) for the applicable weather stations to determine the *fire intensity code*

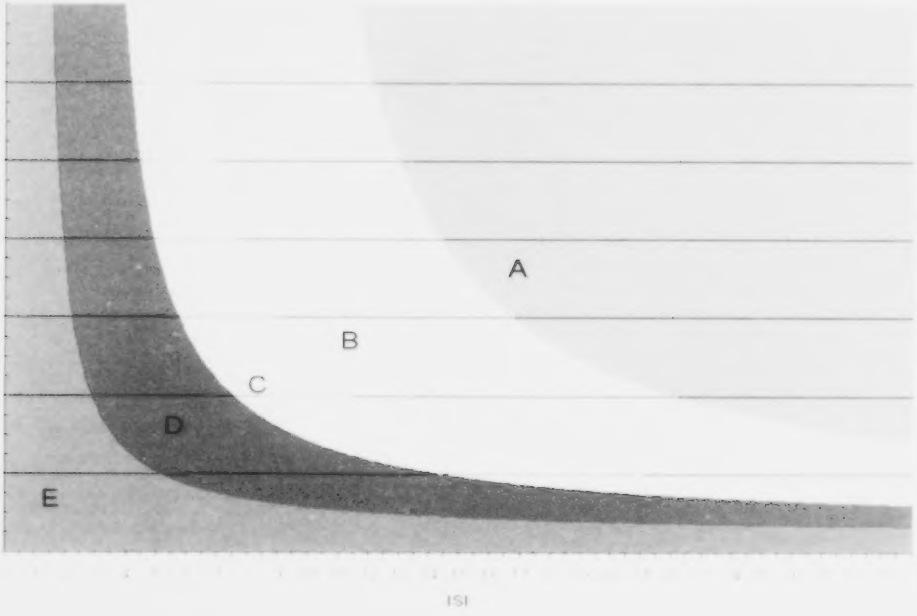
Note: When ISI values are reported to a decimal place the value should be rounded up or down to the nearest whole number (<0.5: round down; >=0.5: round up).



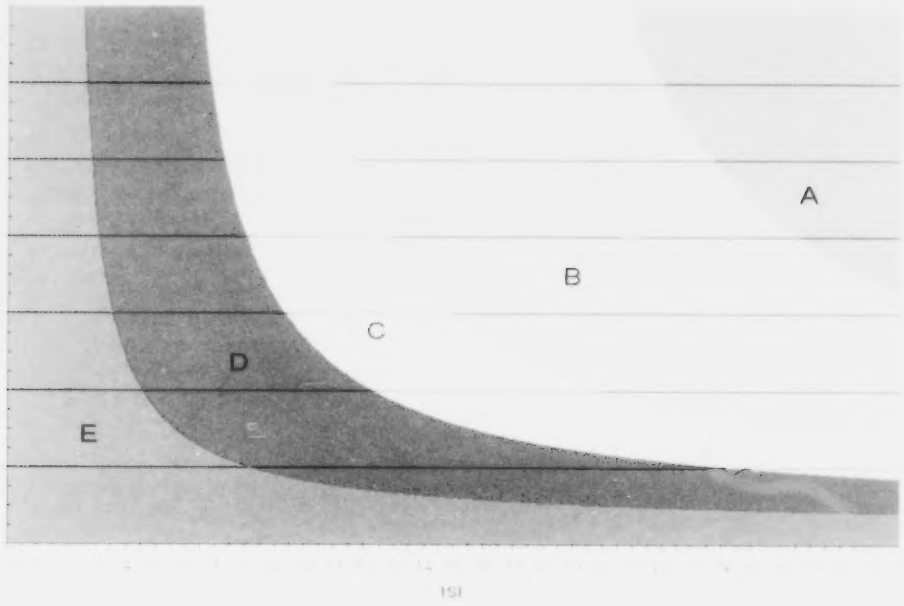
Fuel Group 4



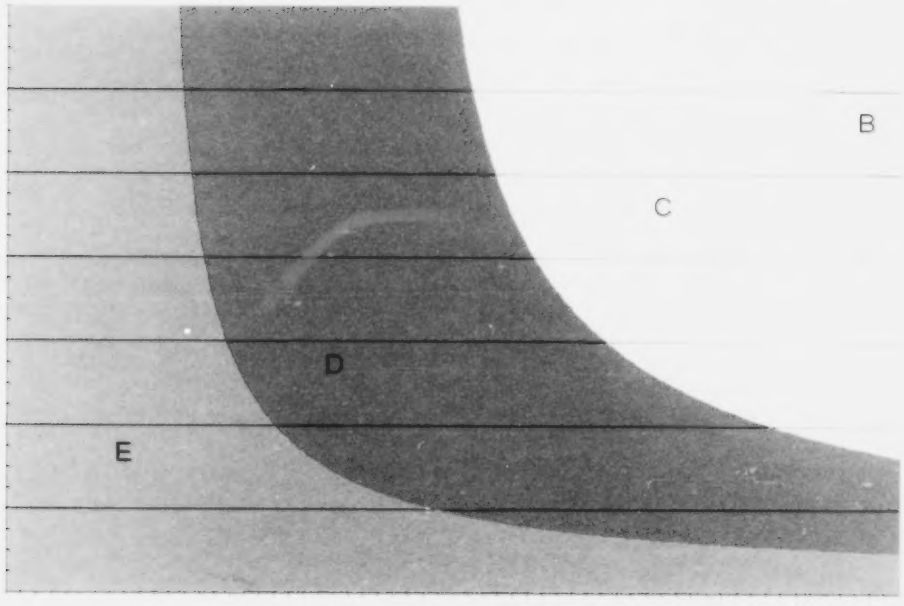
Fuel Group 3

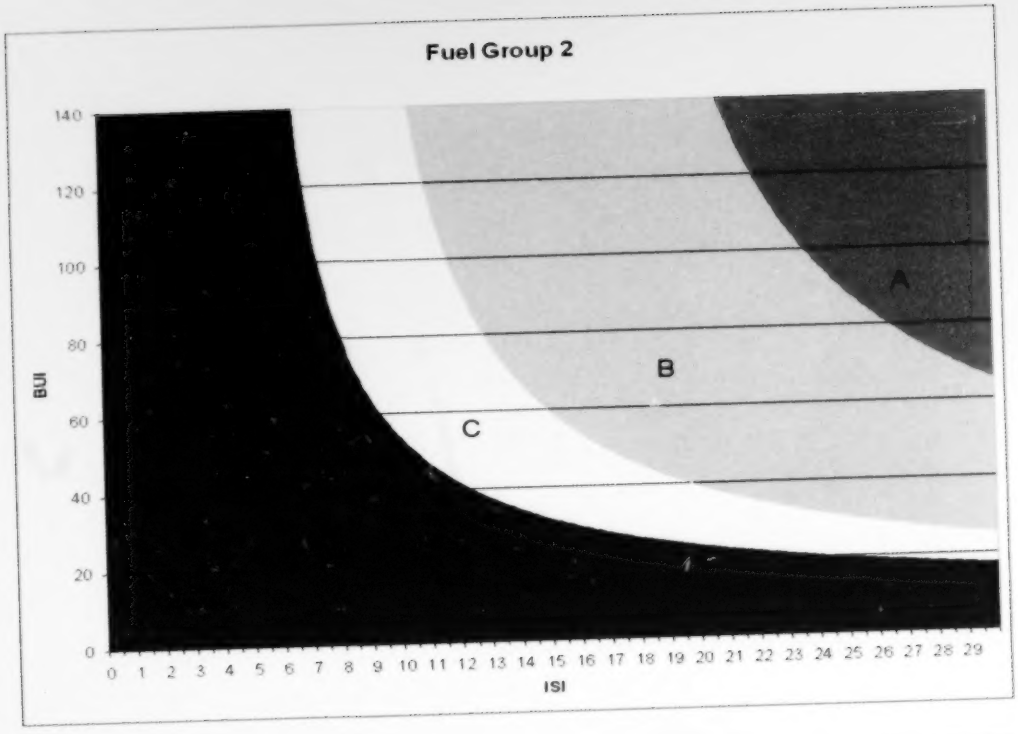


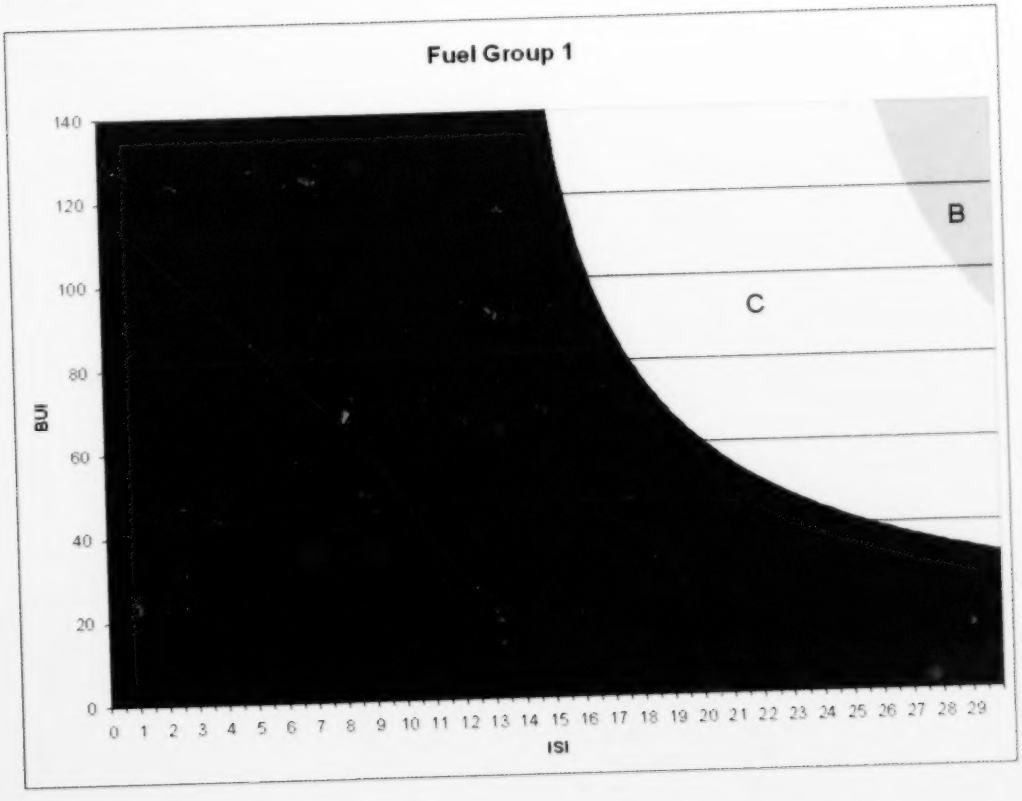
Fuel Group 2



Fuel Group 1




Fuel Group 2
BUI
ISI
A
B
C


Fuel Group 1
BUI
ISI
B
C

4.0 Operational Modifications Table

Table 5 lists the operational modifications required for industrial operations based on the risk of the operation, the daily reported fire intensity code for the fuel group at the work site and the workers' classification as Trained and Capable or Limited Operator. Descriptions of the modifications are outlined following the table.

Table 5: Modified Operations Table

Operational Risk	Fire Intensity Code	Work Modifications	
		Limited	Trained
Very High Risk	**A**	**SD**	**SD**
	B	**SD**	**RS**
	C	**SD**	**SS**
	D	P	P
	E	P	P
High Risk	**A**	**SD**	**RS**
	B	**SD**	**SS**
	C	**SS**	P
	D	P	P
	E	P	P
Moderate Risk	**A**	**SD**	**SS**
	B	**SS**	**SS**
	C	P	P
	D	P	P
	E	P	P
Low Risk	**A, B, C, D & E**	P	P

P = Prevention SS = Short Shift
RS = Restricted Shift SD = Shut Down

4.1 Operational Modifications

Operational modifications (P, SS, RS or SD) will apply starting at 00:01hrs (local time) on the calendar day for which the modification is identified.

P = Prevention (Normal Operations)
Prevention is a part of normal operations and must ensure compliance to Ontario's *Forest Fires Prevention Act* at all times, on all operations. Company fire preparedness and prevention plans must outline and identify how companies will implement activities aimed at preventing wildfires.

SS = Short Shift
Operations are **not** permitted between 12:00 and 19:00, local daylight savings time. Prevention measures still apply and a dedicated patrol* of the area must be carried out for one hour after operations shut down.

RS = Restricted Shift
Operations are **not** permitted between 08:00 and 22:00, local daylight savings time. Prevention measures still apply and a dedicated patrol* of the area must be carried out

for one-hour after operations shut down. Identify water sources close to operations prior to commencing any operations.

SD = Shutdown
Operations are **not** permitted starting at 06:00, local daylight savings time on the first day of shutdown. Operations will remain suspended until conditions change and Prevention, Short Shift or Restricted Shift is indicated. Prevention measures still apply and a dedicated patrol* of the area must be carried out for one hour after operations cease. Once this initial patrol is complete, lower risk operations working in the vicinity can offer dedicated fire patrols during the shutdown period.

* Operators conducting the dedicated patrol must have the ability to immediately report fires.

5.0 Fire Intensity Code Report

The Fire Intensity Codes are computed and reported daily based on forecasted weather for all MNR weather stations. The codes are calculated in the afternoon and are valid for the next day.

The Fire Intensity Codes will be listed for each fuel group by weather station across the province. The code is used to determine the required modifications for each industrial operation for the next day depending on site fuel characteristics and operational risk.

The MNR will normally publish the Fire Intensity Codes by 4pm EDT or 3pm CDT by the following methods:

- **Internet**: MNR Extranet site: *http://www.extranet.mnr.gov.on.ca/home/main.asp*
- **Telephone**: Fire Management Headquarters in each MNR district will provide a recorded telephone message containing the Fire Intensity Codes by fuel group and weather station accessed through a toll-free number.
- **Reports**: A report of fire weather indices faxed/e-mailed to specific offices.

It is the responsibility of industry staff to know the fire intensity codes for the weather stations used by each area of operations daily (the closest weather station to the operation unless otherwise specified in the fire plan). If the Fire Intensity Code Report is not available in a timely manner (i.e., due to technical or other difficulties), industry representatives are responsible for contacting their local fire management headquarters to obtain the fire intensity codes or to receive the indices required to calculate the codes manually.

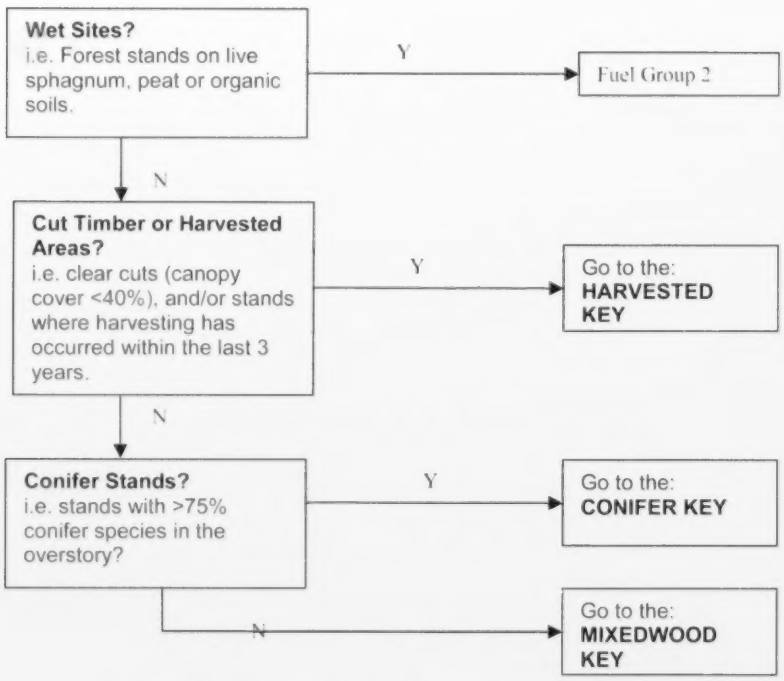
6.0 Fuel Group Decision Keys

6.1 Overview Key

The following overview key directs the user to the proper key for a given forest stand.

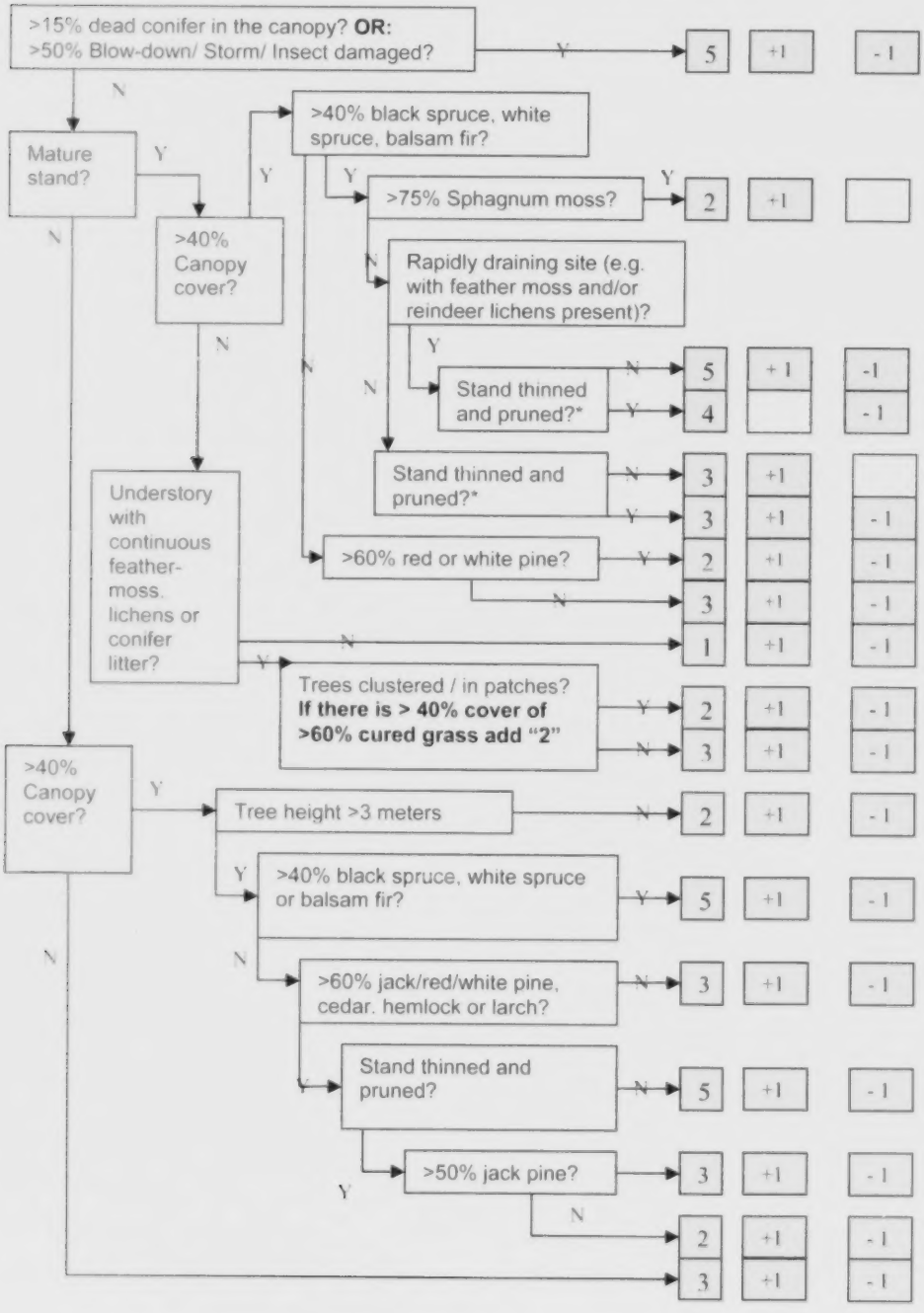
Following through the decision key, an initial fuel group is identified (numbered 1 – 5). Stand Modifiers (+1/ -1) are then applied to make site-specific adjustments. Stand modifiers account for local site factors that may increase or decrease the fire hazard of the site. Some modifiers depend on summer foliar moisture conditions or "Leaf On", as determined each year by the local MNR fire management supervisor in consultation with the regional duty officer.

For determining the fuel group, the amount of forest area or "stand" to be assessed will be representative of the work area to be covered in one day/shift of operation.



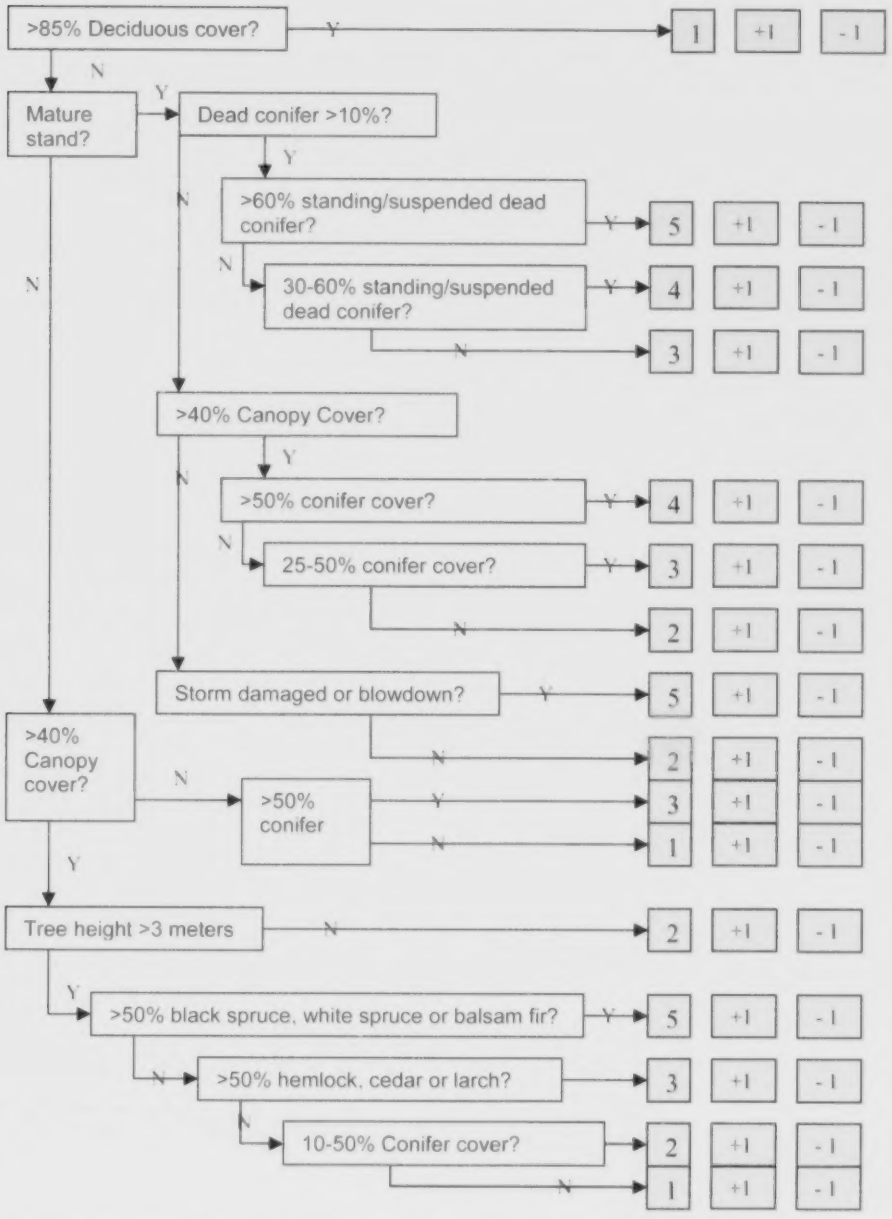
6.2 Conifer Key

>40% black spruce overstory in Leaf-on **OR** >40% cover of deciduous herb or shrub layer in Leaf-on (-1)
>40% Cover live or dead understory conifer (+1)



6.3 Mixedwood Key

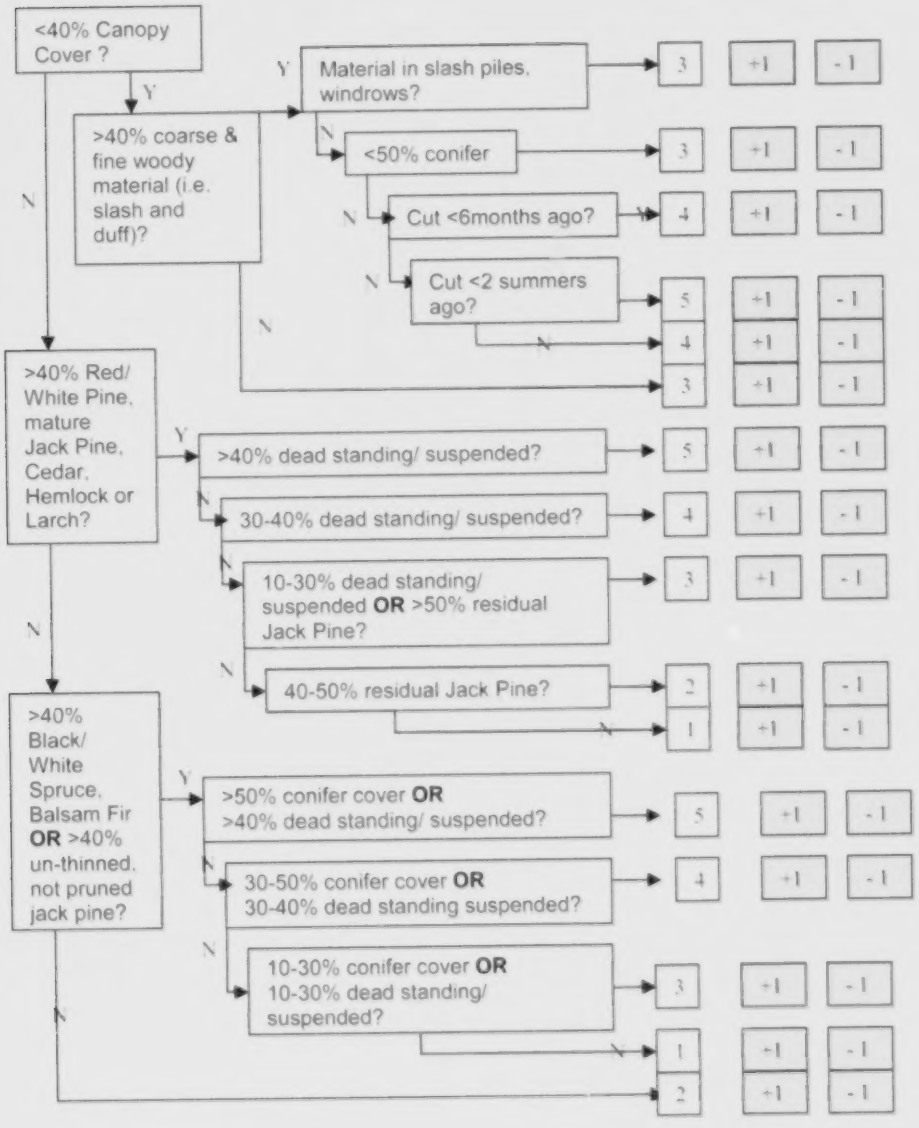
>40% cover of deciduous herb or shrub layer in Leaf-on (-1)
>40% Cover live or dead understory conifer (+1)



Note: "suspended" means slash (or dead material) not in direct contact with the ground

6.4 Harvested Key

>40% cover of deciduous herb or shrub layer in Leaf-on (-1)
>40% Cover live or dead immature conifer (+1)



Note: "suspended" means slash (or dead material) not in direct contact with the ground

7.0 Definitions

Backpack Pump: Means a flexible or rigid container containing 18L of water which is equipped with a serviceable single action hand pump to disperse the water.

Cured Grass: Means dead grass.

Fire Danger: Is a general term used to express an assessment of both the fixed and variable factors of the fire environment (namely the forces of: fuels, weather and topography) that determine fire behaviour.

Fire Equipment Cache: Means a supply of standard fire fighting tools and equipment in planned quantities located at a strategic point for the exclusive use of fire suppression.

Fire Extinguisher: Means a minimum 6A 80BC fire extinguisher.

Fire Hazard: Is a general term used to describe the potential fire behaviour for a given fuel type, based on physical fuel characteristics such as fuel arrangement, fuel load, condition of herbaceous vegetation and the presence of ladder fuels.

Fire Intensity: means the rate of heat energy released per unit time per unit length of fire front, and is expressed in kilowatts per metre (kW/m).

Fire Management Supervisor: Means the fire management supervisor of the local MNR fire management headquarters.

Fire Season: Means the period from April 1 to October 31 each year as per section 10 of the Forest Fires Prevention Act (FFPA) or as set by the Minister as per Sect. 37 of the Forest Fires Prevention Act (FFPA).

Hot Work: Means any work generating significant amounts of heat and includes cutting, grinding, welding and the heating of metals and flaring of gases.

Industrial Activity: Includes land clearing, timber harvesting, timber processing, mechanical site preparation and other silvicultural treatments, gas or oil well operations, mining, highway maintenance and construction, engineering operations, plant harvesting, manufacturing, milling, railroad operations, trenching, or the use of explosives.

Ladder Fuels: Means fuels that provide vertical continuity between the surface and crown fuels in a forest stand thus contributing to the ease of torching and crowning (e.g., tall shrubs, small trees, bark flakes and tree lichens).

Limited Operation: Means an industrial activity or operation which does not meet the standard for trained and capable as defined in this document.

Leaf-off: Means the period of the year when leaves have not yet fully emerged, usually during the spring months, or, when leaves on deciduous species are absent (e.g., in autumn, due to pests or disease damage) as determined by the local fire management headquarters.

Leaf-on: Means the period of the year when leaves have fully emerged and vegetation is lush (usually during the summer months) as determined by the local fire management headquarters.

Mature: For the purpose of fuel group classification, means a forest stand when it is at a stage of development where harvesting could occur, normally at or past, rotation age.

Operational Risk: Means the potential of a given operation or activity to ignite a fire, based on the presence of a potential source of ignition (e.g., a spark).

Peat/Organic Soil: Means a site in which there is organic soil that is commonly saturated with water and consists mainly of mosses, sedges, or other hydrophytic vegetation, extending to a depth of at least 40cm.

Percent Cover: Means the percentage of the area covered by vegetation or by a particular species (e.g., canopy cover is the percent of space taken up by the canopy if you look directly upwards, grass cover would refer to the percent taken up by grass, as you look straight down).

Pumping Unit: Means a serviceable water pump not affixed to another machine that is capable of maintaining a minimum pressure of 65 psi when used with a nozzle with a 1/2" opening attached directly to the pump and includes:

- A toolbox, containing nozzles with assorted tip sizes, wyes, stranglers, hose, wrenches, spark plugs, and assorted hand tools (e.g., screwdriver, pliers, etc.)
- 1 5gal gas can full of proper gas/oil mixture for pump
- 1 intake hose 8–10 ft long with foot valve
- 24 lengths of serviceable 1 1/2" fire hose, each measuring 90–100 ft

Stoniness: The presence of coarse fragments 25cm or greater, at or just below the surface of the soil.

Serviceable: a fire extinguisher is considered serviceable if the maintenance of the portable fire extinguisher(s) meets the requirements of the Ontario Fire Code, Section 6.2.7. For other fire suppression equipment serviceable means equipment that is known to be in a state of working order due to the fact that the equipment has been cleaned, inspected, parts replaced or repaired and the equipment operation has been tested ("run-up") and a tag is affixed stating the tester's name, date tested, location, and that the equipment operated within pre-determined parameters.

Thinned and Pruned: the work area can be considered thinned and pruned if branches, needles, and/or vegetation are absent below a crown base height (CBH) of three meters.

Trained and Capable Operation: Means an industrial activity or operation which meets the standard identified in this document.

Understory conifer: Means mature or immature conifer trees in the understory that are equal to or greater than half the distance from the ground to the bottom of the forest canopy and provide vertical continuity between the surface and crown fuels in a forest stand.

Water Delivery System: Means a system consisting of a minimum 100L water supply, a water pump or equivalent means of pressurizing water, the hoses, attachments and tools necessary for the operation and maintenance of the system that is mounted on a machine that can deliver water to any place on a worksite.

Worksite: Means, in the case of industrial activity other than timber harvesting, the site at which the work is performed, or in the case of timber harvesting or site preparation, an area of land within which an operation is performed during a given day or shift.

Table 1: Suppression Equipment

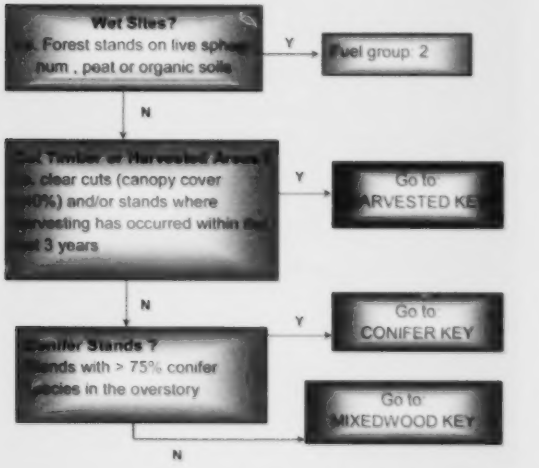
Operations	Number of Machines	Number of Equipment Caches	Suppression Pumps*
Heavy equipment with tire chains or tracks, working in forest fuels	1 — 5	0	1/machine
	6+	1	
OR: Heavy equipment at work within a 10-km radius of each other (Includes hot work)	1 — 9	0	1/machine or hot work operation
	10+	1	
Tree plant, manual tending or other labour-intensive operations		0	1 for every 4 workers maximum 10 per area

* A serviceable pressurized water delivery system located on a machine can replace a backpack pump

** Only one fire equipment cache will be required on site providing it is within 20 minutes (by ground transportation) of all equipment

Fuel Group Keys

The forest area or "stand" to be assessed will be representative of the work area to be covered in one day/shift of operation



Fuel Group 5	Fuel Group 4	Fuel Group 3	Fuel Group 2	Fuel Group 1

Table 2: Operational Risk Table:

	Operation	Exposed bedrock OR = to or >15% Surface Stoniness
Road Construction	Stripping with bulldozer	VH
	Blasting without mats	H
	Blasting with mats	L
	Building, spreading and shaping sub-grade with back hoe/excavator	M
	Graveling/grading roads	L
	Dozer flattening sub grade (mineral soil)	L
	Stream work	L
Harvesting	Tracked equipment such as feller-bunchers, or machines with rotary cutting heads	VH
	Vehicles with tire chains	VH
	Mechanized equipment with rubber tires (no chains) i.e., forwarders, skidders	M
	Power saw or Chainsaw	M
Processing	Delimbing, slashing, portable sawmills	M
	Portable chipping	L
	Loading wood or gravel and hauling	L
	Power saw or Chainsaw	M
Silviculture	Mechanized site preparation	VH
	Mechanized tending with chains flails and mowers; hydro-axe; slash piling	VH
	Brush saw/chainsaw thinning	M
	Tree planting, manual brushing (cleaning)	L
Other	Hot work: welding, torch cutting and grinding	H
	All-terrain vehicles wheels or tracked	M
	Other non-mechanical forest operations (i.e., timber cruising, regeneration surveys)	L

L=Low M=Moderate H=High VH=Very High

Note: Any Operation working exclusively on mineral soil, clay, gravel, (e.g. roads/landings where there is no continuous fuel component) is classified as **Low Risk**

MODIFICATIONS start at 00:01hrs (local time).

P: Preparedness: Is Normal Operations, ensuring compliance to the company fire preparedness & prevention plan.

: **No operations** between **12:00** and **19:00.**

: **No operations** between **08:00** and **22:00**. Identify water sources.

SD = Shutdown: **No operations** starting at 06:00 on the first day of shutdown. Operations will remain suspended until P, SS, or RS is indicated.

All times are in local daylight savings time. When restrictions are in place, a one hour dedicated patrol is needed after operations cease. Prevention measures always apply.

FIELD GUIDE TO THE
MODIFYING INDUSTRIAL OPERATIONS PROTOCOL

1. Minimum Fire Suppression Equipment needed
   Use **Table 1: Suppression Equipment**
2. Determine Operational Risk
   Use **Table 2**: **Operational Risk**
3. Leaf On/Leaf Off condition?
   Local MNR Fire Management Supervisor
4. Determine fuel group (1- 5) on the worksite
   Use: **Fuel Group Decision Keys:**
   Determine initial fuel group & account for modifier (+1/-1)
   Determine final fuel group
5. Obtain the fire intensity code:
   Using the closest weather station
   Based on the worksite Fuel Group
   Reported each afternoon for the next day
6. Determine work modifications, for the next day:
   Use: **Table 5: Operational Modifications**
7. Modify operations the next day as necessary

Table 5: Operational Modifications

Operational Risk	Fire Intensity Code	Work Modification Limited	Work Modification Trained
Very High Risk	A	SD	SD
	B	SD	RS
	C	SD	SS
	D		
	E		
High Risk	A	SD	RS
	B	SD	SS
	C	SS	
	D		
	E		
Moderate Risk	A	SD	SS
	B	SS	SS
	C		
	D		
	E		
Low Risk	A,B,C,D,& E		

SS = Short Shift

RS = Restricted Shift SD = Shut Down

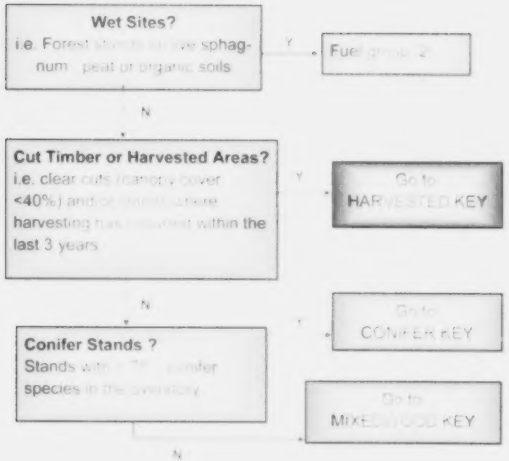
Table 1: Suppression Equipment

Operations	Number of Machines	Number of Equipment Caches	Backpack Pumps*
Heavy equipment with tire chains or tracks working in forest fuels	1 — 5	0	1/machine
	6+	1	
OR**: Heavy equipment at work within a 10-km radius of each other (includes hot work)	1 — 9	0	1/machine or hot work operation
	10+	1	
Tree planting, manual tending or other labour-intensive operations		0	1 for every 4 workers (maximum 10 per site)

*A recognizable pressurized water delivery system capable of providing a sustained water flow and equipped with a backpack pump.

**Only one fire suppression cache should be required per crew working in close proximity (to provide the required tools and fire suppression).

Fuel Group Keys


Wet Sites?
i.e. Forest stands of live sphagnum peat or organic soils
Y
Fuel group 2
N
Cut Timber or Harvested Areas?
i.e. clear cuts (canopy cover <40%) and/or commercial harvesting has occurred within the last 3 years
Y
Go to HARVESTED KEY
N
Conifer Stands ?
Stands with 75% conifer species in the overstory
Y
Go to CONIFER KEY
Go to MIXEDWOOD KEY
N

Fuel Group 5	Fuel Group 4	Fuel Group 3	Fuel Group 2	Fuel Group 1

Table 2: Operational Risk Table:

Operation	Exposed bedrock OR = to or >15% Surface Stoniness	Surface stoniness < 15%	
Road Construction	Stripping with bulldozer	M	VH
	Blasting without mats	M	H
	Blasting with mats	L	L
	Building, spreading and shaping sub-grade with back hoe/excavator	L	M
	Graveling/grading roads	L	L
	Dozer flattening sub grade (mineral soil)	L	L
	Stream work	L	L
Harvesting	Tracked equipment such as feller-bunchers, or machines with rotary cutting heads	H	VH
	Vehicles with tire chains	H	VH
	Mechanized equipment with rubber tires (no chains) i.e. forwarders, skidders	L	M
	Power saw or Chainsaw	L	M
Processing	Delimbing, slashing, portable sawmills	M	M
	Portable chipping	L	L
	Loading wood or gravel and hauling	L	L
	Power saw or Chainsaw	L	M
Silviculture	Mechanized site preparation	H	VH
	Mechanized tending with chains flails and mowers, hydro-axe, slash piling	H	VH
	Brush saw/chainsaw thinning	L	M
	Tree planting, manual brushing (cleaning)	L	L
Other	Hot work, welding, torch cutting and grinding	H	H
	All-terrain vehicles wheels or tracked	L	M
	Other non-mechanical forest operations (i.e. timber cruising, regeneration surveys)	L	L

L=Low M=Moderate H=High VH=Very High

Note: Any Operation working exclusively on mineral soil, clay, gravel (e.g. roads, landings, where there is no continuous fuel component) is classified as Low Risk

MODIFICATIONS start at 10:00 in the local time

Normal Operations, ensuring compliance to the company fire preparedness & prevention plan

No operations between 12:00 and 19:00

No operations between 08:00 and 22:00 (Identify water sources)

No operations starting at 09:00 on the first day of shutdown. Operations will remain suspended until P, SS, or RS is implemented

Additional requirements may be implemented by the local MNR Fire Management Supervisor

Prevention measures (verify area)

1. Minimum Fire Suppression Equipment needed
   Use Table 1: Suppression Equipment
2. Determine Operational Risk
   Use Table 2: Operational Risk
3. Level On Level Off (complete)?
   Local MNR Fire Management Supervisor
4. Determine fuel group (1-5) on the worksite
   Use Fuel Group Decision Keys.
   Determine initial fuel group & account for modifier (+1 or -1)
   Determine final fuel group
5. Obtain the fire intensity code
   Using the closest weather station
   Based on the worksite Fuel Group
   Reported each afternoon for the next day
6. Determine work modifications for the next day
   Use Table 5: Operational Modifications
7. Modify operations the next day as necessary

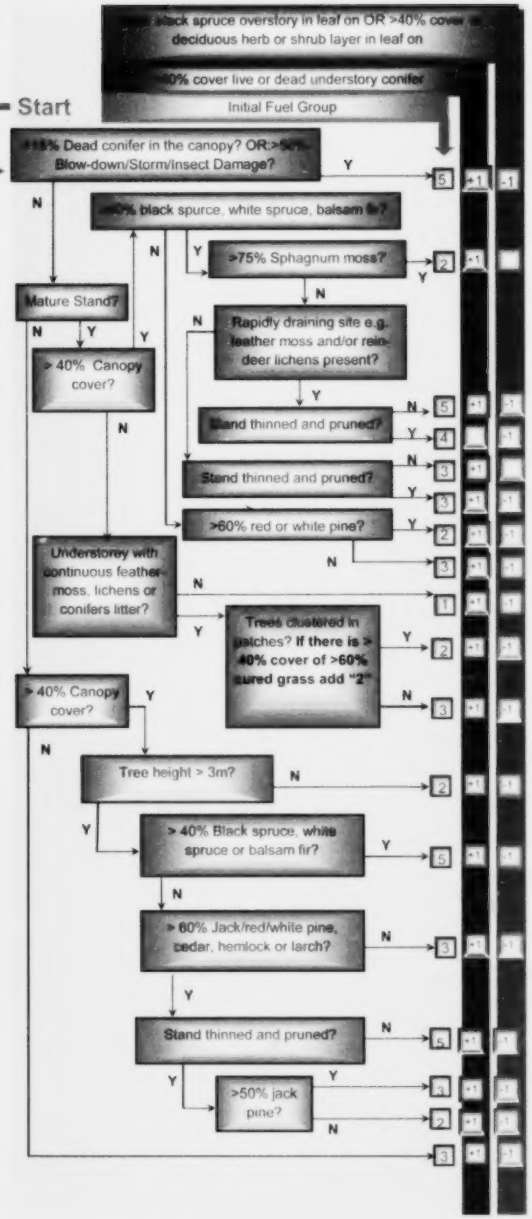
Table 5: Operational Modifications

Operational Risk	Fire Intensity Code	Work Modification Limited	Work Modification Trained
Very High Risk	A	SD	SD
	B	SD	RS
	C	SD	SS
	D	P	P
	E	P	P
High Risk	A	SD	RS
	B	SD	SS
	C	SS	P
	D	P	P
	E	P	P
Moderate Risk	A	SD	SS
	B	SS	SS
	C	P	P
	D	P	P
	E	P	P
Low Risk	A,B,C,D,& E	P	P

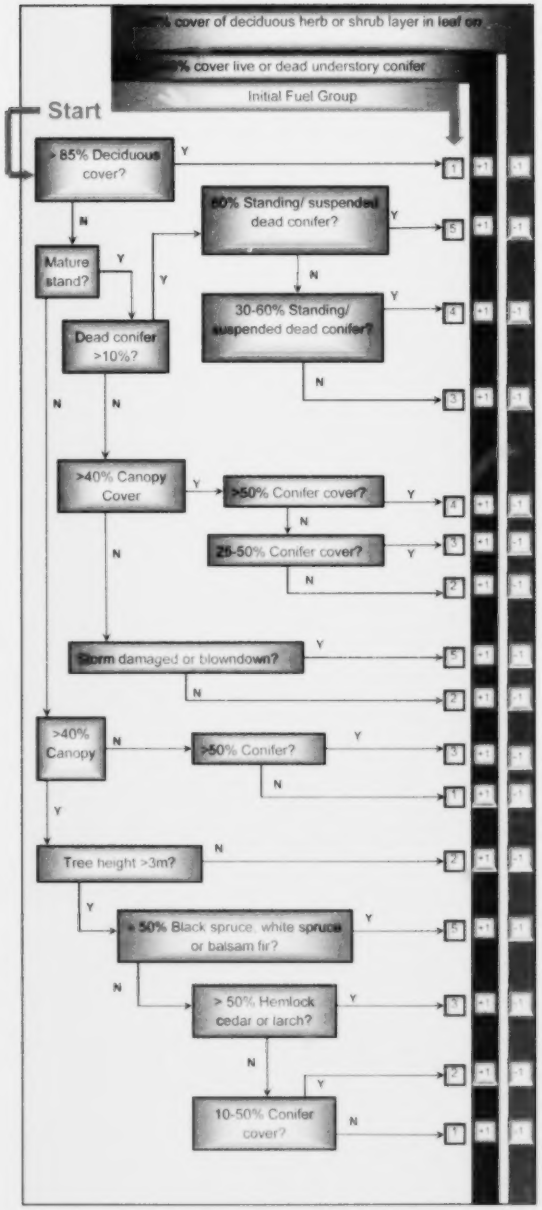
P = Prevention SS = Short Shift

RS = Restricted Shift SD = Shut Down

Conifer Fuel Group Key

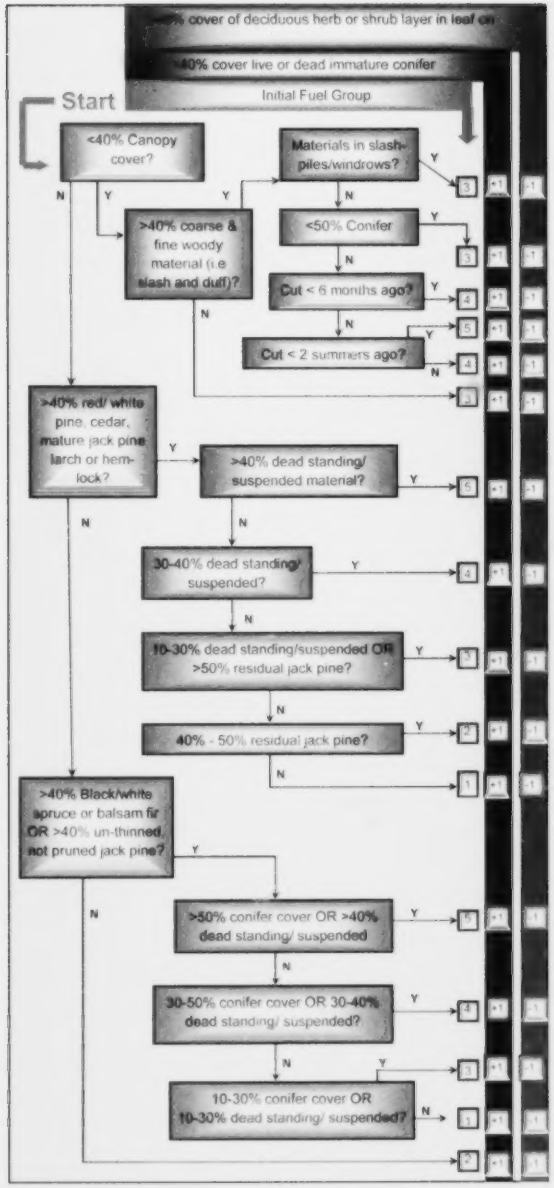

Start
Initial Fuel Group
% cover live or dead understory conifer
deciduous herb or shrub layer in leaf on
Dead conifer in the canopy? OR>50% Blow-down/Storm/Insect Damage?
% black spruce, white spruce, balsam fir?
>75% Sphagnum moss?
Mature Stand?
> 40% Canopy cover?
Rapidly draining site e.g. feather moss and/or reindeer lichens present?
Stand thinned and pruned?
Stand thinned and pruned?
>60% red or white pine?
Understorey with continuous feather-moss, lichens or conifers litter?
Trees clustered in patches? If there is > 40% cover of >60% cured grass add "2"
> 40% Canopy cover?
Tree height > 3m?
> 40% Black spruce, white spruce or balsam fir?
> 60% Jack/red/white pine, cedar, hemlock or larch?
Stand thinned and pruned?
>50% jack pine?

Mixedwood Fuel Group Key


Start
Initial Fuel Group
% cover of deciduous herb or shrub layer in leaf on
% cover live or dead understory conifer
> 85% Deciduous cover?
Mature stand?
Dead conifer >10%?
60% Standing/ suspended dead conifer?
30-60% Standing/ suspended dead conifer?
>40% Canopy Cover
>50% Conifer cover?
25-50% Conifer cover?
Storm damaged or blowndown?
>40% Canopy
>50% Conifer?
Tree height >3m?
> 50% Black spruce, white spruce or balsam fir?
> 50% Hemlock cedar or larch?
10-50% Conifer cover?

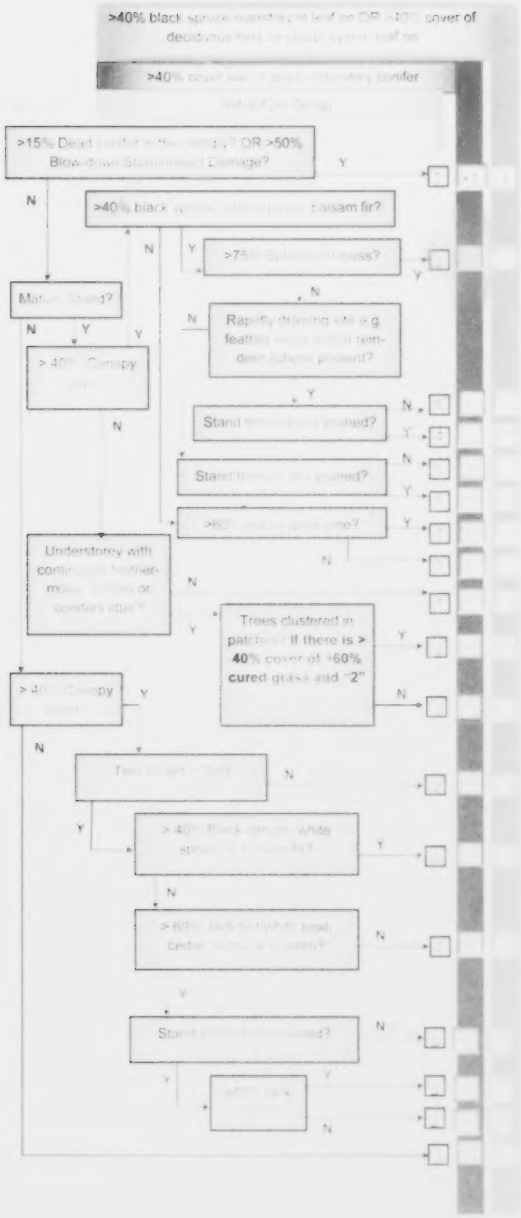
Note that "suspended" means slash (or dead material) not in direct contact with the ground

Harvested Fuel Group Key

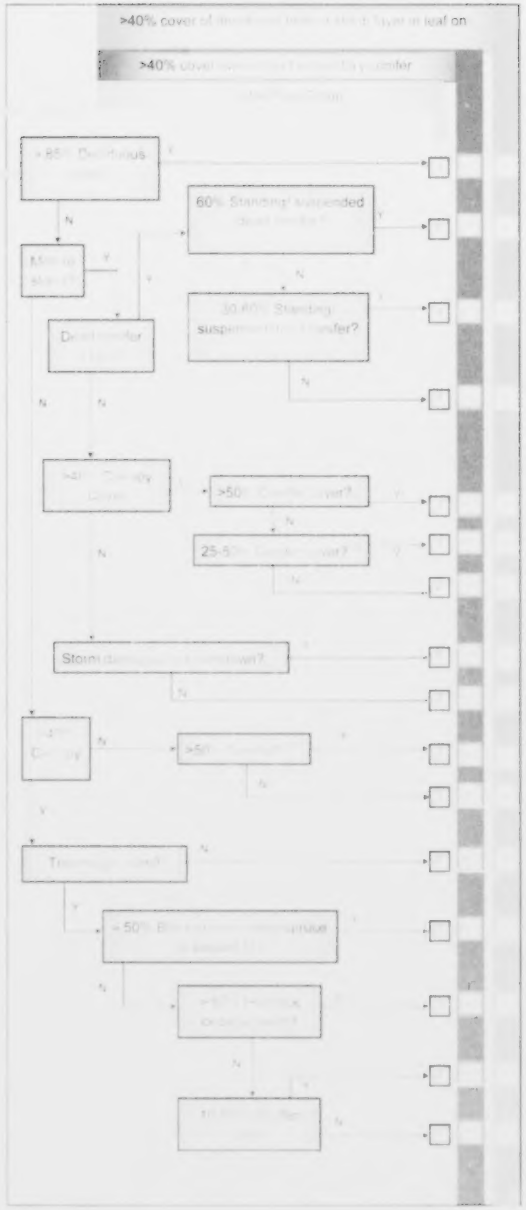

Start
Initial Fuel Group
% cover of deciduous herb or shrub layer in leaf on
40% cover live or dead immature conifer
<40% Canopy cover?
Materials in slash-piles/windrows?
>40% coarse & fine woody material (i.e slash and duff)?
<50% Conifer
Cut < 6 months ago?
Cut < 2 summers ago?
>40% red/ white pine, cedar, mature jack pine larch or hem-lock?
>40% dead standing/ suspended material?
30-40% dead standing/ suspended?
10-30% dead standing/suspended OR >50% residual jack pine?
40% - 50% residual jack pine?
>40% Black/white spruce or balsam fir OR >40% un-thinned, not pruned jack pine?
>50% conifer cover OR >40% dead standing/ suspended
30-50% conifer cover OR 30-40% dead standing/ suspended?
10-30% conifer cover OR 10-30% dead standing/ suspended?

Note that "suspended" means slash (or dead material) not in direct contact with the ground

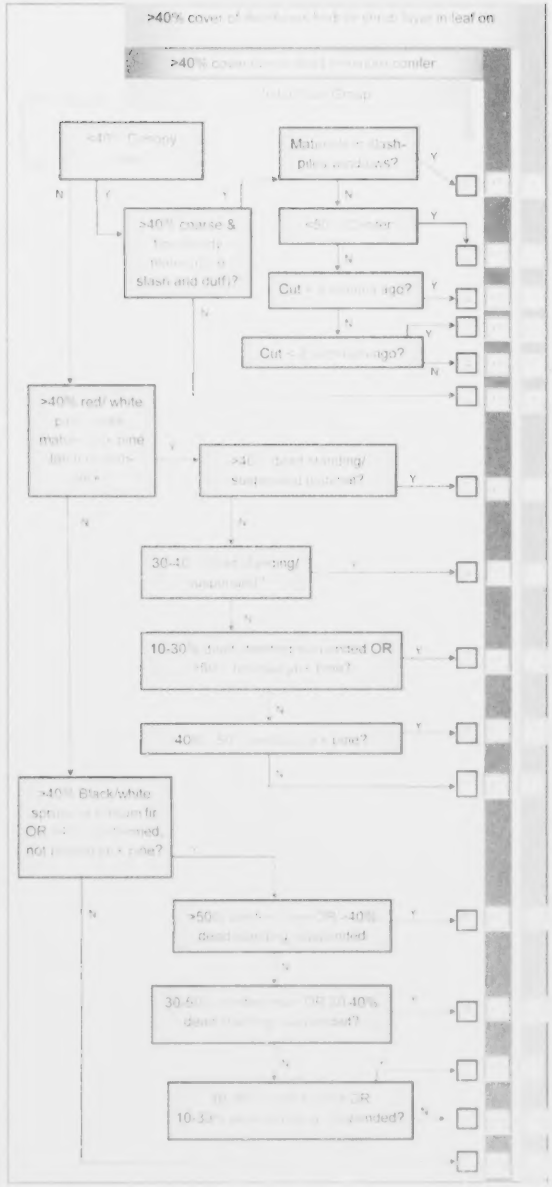
Conifer Fuel Group Key



Mixedwood Fuel Group Key



Harvested Fuel Group Key



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2.5K P.R. 08 01 31
ISBN 978-1-4249-5545-9 Print